CHAPTER 3
DESIGN METHODS

3-1. General. The first step in designing an air stripper is to determine the extreme operating conditions: VOC concentrations allowed in the effluent, VOC concentrations in the influent, minimum liquid temperature, and influent flow rate (minimum and maximum). The next step is to calculate the total daily contaminant loading to the stripper and verify if the loading exceeds any regulation for discharge in the off-gas. A cost comparison (including water pre-treatment and off-gas treatment) is used to determine the optimum type of air stripper (packed column, low profile, or diffused aeration). Zoning regulations may limit stripper or stack height, or both. Manufacturers' software, commercial software, analytical equations, or graphical methods are used to size the air stripper, and are listed below.

3-2. Packed Column. Packed column air strippers are usually designed by the engineer and filled with commercially available plastic packing. The following methods are available for determining the size of a packed column air stripper:

- Analytical equations: Treybal (1980), Montgomery (1985), Shulka and Hicks (1984), Ball et al. (1984).
- Commercial software: "AirStrip," (Iowa State University, 1988).
- Manufacturer supplied software: Carbonair Environmental Systems, North East Environmental Products (see Paragraph A-5).
- McCabe-Thiele graphical method: McCabe et al. (1993), Treybal (1980).

3-3. Sieve Tray. Internal components of sieve tray air strippers, such as tray dimensions, hole diameter, and weir height, are different for each manufacturer. The manufacturer or fabricator designs sieve tray strippers. Each manufacturer has software designed specifically for their units. The following methods are available for determining the size of a low profile sieve tray air stripper:

- Analytical equations: Treybal (1980).
- Manufacturer supplied software: Carbonair Environmental Systems, North East Environmental Products (see Paragraph A-5).
- McCabe-Thiele graphical method: McCabe et al. (1993), Treybal (1980).

3-4. Diffused Aeration. Most "diffused aeration air strippers" are equalization basins with aeration added through diffusers to keep fine particulates in suspension. Unless the basins are extremely deep relative to their length and width, most of the "stripping" is attributable to surface diffusion. This phenomenon is caused by the short contact between the air and water and the lack of turbulence compared to engineered strippers. The effectiveness of diffused air stripping has been extensively researched (Kyosai, 1991; Parker and Monteith, 1996; Sadek et al., 1996). Diffusers are designed by the diffuser manufacturer to transfer air into the water in combination with either separation of phases, as in dissolved air flotation (DAF), or mixing, as in activated sludge (AS). Water 8 (EPA, 1995) provides a model for evaluating the stripping potential of various aeration basin configurations.